**Market Opportunities for Employment-Intensive Sustainable Energies: Elements for a Strategy to Promote Local Employment and Value through RE/EE**

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| **Part 1: Structure and Evolution of the Political and Institutional Framework** | |
| **Policy Goals and Targets** | **National RE Strategy[[1]](#endnote-1)**  Target:RE contribution to the electric energy mix:   * 2022: **20%** * 2030: **30-40%** * 2050: **65%**   **RE Plan (2015 – 2022)[[2]](#endnote-2)** Target: to bring 9,637 MW to the grid by 2022:   |  |  | | --- | --- | | **by technology** | **by mechanism** | | **PV:** 2,777 MW | * **NREA (EPC):** 77 MW * **EETC (BOO):** 400 MW * **Feed-in Tariff:** 2,300 MW | | **CSP:** 50 MW | * **EETC (BOO):** 50 MW | | **Wind:** 6,810 MW | * **NREA (EPC):** 3,140 MW * **EETC (BOO):** 750 MW * **IPP:** 920 MW * **Feed-in Tariff:** 2,000 MW |   **EE Plan (2015 – 2022)[[3]](#endnote-3)**   * Target: EE to contribute by **8%** to the reduction of energy needs by 2022 (equivalent to 20% of current usage). * MoERE planned to implement a **new NEEAP** for a period of 5 years by March 2016 – but so far it is not published.[[4]](#endnote-4)   **Sustainable Development Strategy (2015-2030)[[5]](#endnote-5)**   * Increase **GDP growth rate** from 2% to 12% * Increase **investment rate** from 14% to 30% * Increase **contribution of services to GDP** from 46% to 70% * Decrease **unemployment rate** from 13% to 5%   **Industrial Development Strategy (IDS)** until 2015 (the development of a new strategy by the Ministry of Trade and Industry (MTI) is supported by the EU’s Trade and Domestic Market Enhancement Program (TDMEP))  **Target:** Being a leading industrializing nation in the MENA region in terms of industrial performance as well as a main export hub for medium-technology manufactured products:   * higher growth in industrial production through **export development and FDI attraction** * carefully-designed set of policies and programs aiming at leveraging **industrial productivity and competitiveness** * gradual shift from resource-based and low-tech activities to **medium- and high-tech industries**   **Education Strategy**  No government- or private sector- driven education strategy is in place. |
| **Legal-Regulatory Framework** | **Electricity Law (87/2015)** Restructuring of the electricity sector:   * + End of single buyer system for electricity 🡪 private companies can sell their production to end users   + Third party access to the grids   + Separation of the government-owned and -operated EETC into an independent transmission system operator (TSO)   **Renewable Energy Law (203/2014)** Envisaged project structures:   * 1. **Governmental Projects:**  NREA issues tenders to private-sector companies and operates the projects. Produced electricity will be sold to EETC at a price suggested by EgyptERA.   2. **Competitive Bids:**  Projects are tendered by EETC; the private investor builds, owns and operates (BOO) the project and enters into a long term PPA with EETC.   3. **Feed-in Tariff (FiT):**  Private investors establish projects (BOO) and sell the generated electricity via a PPA to EETC on basis of the FiT enacted by Decree 1947/2014.   4. **Independent Power Producers (IPP):**  Private investors can enter into direct PPAs with (large) consumers and will be granted access to the grid for an access fee.   **Take or pay commitment**: EETC and the distribution companies are under a legal obligation to buy the electricity generated by qualifying projects or, if the take-off is not possible, to compensate the investor. All financial obligations that EETC has taken are guaranteed by the Ministry of Finance (MoF).  **Tender Law (89/1989)**  A tenderer without a legal presence in Egypt must appoint an Egyptian “tender agent” which acts as the point of contact for the tendering authority. If the project is financed through international development cooperation, the procurement rules of the relevant financing institution will apply in addition to the Tender Law.  **EE Building Codes**   * EE code for residential buildings (2006) * EE code for commercial buildings (2009) * EE code for governmental buildings (2011) |
| **Support Programs and Financing Schemes** | **Feed-in Tariff (FiT):** The FiT was enacted by Decree 1947/2014 in October 2014 and complemented by Law 203/2014 of 22 December 2014. Key indicators of the pricing system are:   |  |  | | --- | --- | | **Solar projects** (FiT granted for 25 years): | **Wind projects** (FiT granted for 20 years): | | * <200 KW: 0.118 USD/kWh * 200 KW – 500 KW: 0.127 USD/kWh * 500 KW – 20 MW: 0.136 USD/kWh * 20 MW – 50 MW: 0.143 USD/kWh | * during the initial 5 years:  0.0957 USD to 0.1148 USD * for the remaining 15 years:  0.0460 USD to 0.1148 USD   depending on the hours of operation. |   Although the prices are determined in USD, the feed-in remuneration will be paid in EGP. The costs of the connection are borne by the producer, while the government shall fund any extension of the grid. The EETC is obligated to buy renewable electricity from selected participants.  **RE Fund:**  In January 2012, a fund dedicated to financing RE projects was approved by the cabinet. Financing sources and disbursement procedures are still under discussion.[[6]](#endnote-6) In addition, the **RE Fund** shall back FiT payments.[[7]](#endnote-7)  **Tax Incentives** (Investment Law 8/1997, Presidential Decree 17/2015):  RE investors pay   * **…reduced sales taxes of 5%** (instead of 10%) * **…reduced customs duties** on equipment used for RE production **of 2%** (instead of 5%).   **Reduced Interest Rates for RE/EE measures in Hotels**  In 2013, the National Bank of Egypt pledged to extend loans to establishments wishing to convert to RE at a minimal **interest rate of 2%** (protocol signed with Egyptian Hotel Association & Solar Energy Development Association, SEDA).  **Loans for rooftop PV**  In 2015, an initiative to provide loans for rooftop PV installations was announced by EBA (Egyptian Businessmen’s Association) with **interest rates between 4% and 8%.** The loans will be provided by the National Bank of Egypt and Banque Misr.[[8]](#endnote-8)  **International Financing**  Most of Egypt’s financing for RE promotion comes from international soft finance (e.g. through existing cooperation with international donors for wind parks).  **Green Pyramid Rating System (GPRS)**  developed in 2010 to rate the green credentials of buildings:   |  |  | | --- | --- | | Green Pyramid Category | Category Weighting | | 1. Sustainable Site, Accessibility, Ecology  2. Energy Efficiency  3. Water Efficiency  4. Materials and Resources  5. Indoor Environmental Quality  6. Management  7. Innovation and Added Value | 15 %  25 %  30 %  10 %  10 %  10 %  Bonus | |
| **Grid and Market Access (Internal and External)** | **The Electricity Law** (87/2015) created **two electricity markets**:   1. **Competitive market**: qualified consumers (high voltage customers “HV”) are allowed to freely choose their electricity suppliers based on bilateral direct agreements and negotiated electricity prices. 2. **Regulated market**: unqualified consumers (medium and low voltage customers “MV”/“LV”) pay a regulated tariff and purchase electricity from the distribution companies who will be supplied by a public trader.   **Prerequisites for production/distribution:** [[9]](#endnote-9)   * **License** from EgyptERA:  Fee: 1% of the price of every electricity unit produced or purchased, or of the charge of interconnection with the grids. (Temporary permit: EGP 2000/authorized MW) * **SPV** in the form of a joints stock company for negotiations over the land, the land bond and the connection fees.   **Guaranteed Access to the Grid**   * for private renewable electricity producers * on a clear, transparent and non-discriminatory basis * grid connection contract with EETC * access fee (wheeling charge) borne by the producer   **Net-Metering**   * adopted in January 2013 by EgyptERA * small-scale PV projects allowed to feed in electricity to the grid * generated surplus electricity is discounted from the balance * electricity metering systems are supplied by the relevant electricity distribution company; however the subscriber bears its cost   **Current Market and Grid Situation**  To date, the RE market is still relatively small and mainly project-based / driven by international donors. In the last years, insufficient maintenance of the transmission grid plus lack of generation capacity have led to several blackouts in the country. |
| **Other Issues (e.g. Zoning and Land Allocation)** | **Land Use[[10]](#endnote-10)**   |  |  | | --- | --- | | Property: | * Most of the land used for RE projects is government-owned. | | Allocation: | * All permits for distributing this land have been handed over to NREA. * The land is allocated on a first-come first-served basis based on the investors’ preferences and the plots’ availability. | | Usufruct: | * It is allocated to the investor on the basis of a usufruct (manfa’) for a term of 25 years for solar projects and 20 years for wind projects. * The cost of the usufruct is 2% of the value of the sold energy. | | Current Status: | * More than 7,600 km2 of desert land for the deployment of future public and private wind farms has been allocated so far. | |
| **Verification and Evaluation Mechanisms** | Monitoring and evaluation is difficult as there is still a lack of data concerning the RE/EE development and its socio-economic effects. |
| **Open Issues / Reforms** | * Subsidy cuts (see part 2) * Updated NEEAP |
| **Main Obstacles / Gaps** | * Lack of RE-related socio-economic data |

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| **Part 2: Structure and Evolution of the Energy System** | |
| **State & Key Properties of the Energy System** | **Generation:**  Egypt is the **largest oil producer in Africa** outside of the Organization of the Petroleum Exporting Countries (OPEC) and after Algeria it is the **second-largest natural gas producer in Africa**.[[11]](#endnote-11)  In 2013, more than 96% of the energy was produced from gas and oil, whereas the potential of RE sources has only been exploited to a small extend (figure 1). Within the context of the new RE strategy, however, the energy mix is planned to be oriented further towards RE sources focusing especially on solar and wind.  Besides, the Egyptian government is interested in nuclear power generation. In 2015, President Abdel Fattah El-Sisi signed an agreement with the Russian President Vladimir Putin to build a nuclear power plant, which is expected to start operation in 2022.[[12]](#endnote-12)  Figure 1: Energy Production in Egypt in 2013. Source: own illustration based on: <http://www.iea.org/statistics/statisticssearch/report/?year=2013&country=EGYPT&product=Balances>  **Distribution/Transmission**  In 2014, 99.6% of the Egyptian population was officially connected to the electricity grid. Although the country has one of the highest electrification rates in Africa, still 300,000 people do not have access to the grid, especially in rural and touristic areas (in addition to large numbers of illegal settlements and hence non-formally connected residents in urban areas, especially in Greater Cairo). Electricity transmission and distribution is carried out by state-owned as well as private companies (for the list see “Main Producers / Transporters” below).[[13]](#endnote-13)  Besides rising power demand and supply shortages, the aging infrastructure as well as inadequate generation and transmission and refining capacities have, however, led to frequent blackouts in Egypt.  Egypt's electric transmission grid is already connected to Jordan, Syria, Iraq, Turkey, and Libya (with a large 3,000 MW connection with Saudi Arabia expected to become operational in 2016). Moreover, the country is part of the Nile Basin Initiative and has tentative plans to interlink its transmission grid with nearby African countries within this organization.  Moreover, there are gas pipelines connecting Egypt to Israel, Jordan and Libya.  **Consumption**  Egypt is now the country with the **highest energy consumption in Africa**. Reasons for its high energy demand are an increased industrial output (with very high energy intensity rates), economic growth, population growth, a strong increase in private and commercial vehicle sales, and very high energy subsidies, especially for end consumers.[[14]](#endnote-14)  In terms of consumption as well as exports, natural gas has replaced oil. 53% of the energy demand in 2013 was satisfied by natural gas, whereas the share of oil amounted to 41% (figure 2). Hydro and other RE sources only made up some 4% of the energy consumption in Egypt in 2013. The remaining 2% of energy demand was satisfied by imported coal.  As can be seen in figure 3, the **largest energy consumption in 2013 took place in the transport sector** with 32.5%, followed by the industry (29.1%) and the residential sector (26%).  Figure 2: Energy Consumption in Egypt in 2013, by fuel. Source: own illustration based on:  <http://www.eia.gov/beta/international/analysis.cfm?iso=EGY>  **Import/Export**  Egypt has a **strategic position in oil transfer** because of its operation of the Suez Canal and Sumed (Suez-Mediterranean) Pipeline, two major routes for the transfer of Persian Gulf oil. However, Egypt's oil consumption currently outpaces its oil production. As a result, the country must **import petroleum products** in order to make up for the difference.  In terms of **natural gas**, Egypt is a **net exporter**. As, however, production is declining whereas the domestic demand is continuingly rising, Egypt has diverted natural gas supplies from exports to domestic consumption.  In 2014, the Egyptian government approved the industrial use of coal and signed a construction deal for the first coal-fired power in the country. Therefore, **coal imports** of Egypt are expected to increase in the short and medium term.[[15]](#endnote-15)  Figure 3: Energy Consumption in Egypt in 2013, by sector. Source: own illustration based on: <http://www.iea.org/statistics/statisticssearch/report/?year=2013&country=EGYPT&product=Balances> |
| **State & Key Properties of Renewable Energies** | http://www.geni.org/globalenergy/library/renewable-energy-resources/world/middle-east/wind-middleeast/wind-egypt1.pngEgypt has **substantial potential for wind and solar energy**: Two-thirds of the country’s area have a solar energy intensity of more than 6.4 kWh/m2/day. At the Red Sea coast, along the Gulf of Suez and in the Nile Valley, the wind speed approaches 10 m/sec in many locations.[[16]](#endnote-16)  **Wind and Solar Atlas**  A detailed **wind atlas** was compiled between 1998 and 2005 in a joint effort by NREA, the Egyptian Meteorological Authority (EMA) and the Danish UNEP Risø research center.  A consortium of international organizations led by the German Aerospace Center (DLR) has developed an **interactive solar atlas** for the Mediterranean region:  <http://www.solar-med-atlas.org/>  **Hydropower**  With 2.8 GW of installed capacity in 2013, hydropower is Egypt's 3rd largest energy source after natural gas and oil. Most of the hydroelectricity comes from the Aswan High Dam. As, however, the potential has already been exploited to a very large extent, Egypt is now actively pursuing other RE sources, primarily solar and wind power.  Figure 4: Installed RE Capacity in Egypt. Source: <http://resourceirena.irena.org/gateway/countrySearch/?countryCode=EGY#carousel_figures>  **Wind Power**  With 750 MW of installed capacity in 2015, wind has come to play a major role for Egypt as well. Egypt generates wind power mainly from the 545 MW Zafarana wind farm (Egypt's largest non-hydro RE project and the largest wind park in the MENA region) and several other large sites along the Red Sea coast and in the Gulf of Suez area. The government plans to further expand the wind capacity over the coming years. EETC has launched a 250 MW wind tender in August 2015 (BOO).  **Solar Power**  With 35 MW of installed capacity in 2013, solar power accounts only for a small part of Egypt’s energy production. However, the country plans to increase its solar generation capacity substantially until 2027.[[17]](#endnote-17)   * **PV:**   + Decentralized small-scale **off-grid PV** systems with a capacity of **15 MW** (lighting, water pumping, wireless communications, cooling and commercial advertisements on highways).   + EETC has launched a **200 MW solar PV tender** in August 2015 for PV projects in the West Nile region (BOO). The selection process is currently underway.   + In addition, Egypt is planning to build **20 MW** PV plants in **Hurghada** and in **Kom Ombo**.   + **Net Metering** for PV roof-top installations exists, but the process is currently stalled. * **CSP:**   + Egypt's first solar-thermal (combined cycle) power plant, located in **Kuraymat**, has the capacity to generate 20 MW of solar thermal energy using CSP as a fuel saving device.   + EETC has launched a **50 MW CSP tender** in August 2015.   + Another **100 MW CSP plant** was to be built in **Kom Ombo,** but the process is on hold. * **SWH:**   + NREA estimates the number of SWH at ​​about **400,000** with a collector area at 800,000 m2. There is a high potential of SWH in Egypt with a predicted exponential increase.   + There are 10-20 manufacturers and installers of SWH in the country (partly members of SEDA).   + **EGYSOL initiative** (2009-2012): equipment of 40 hotels on the Red Sea coast and in the Sinai provinces with SWH (with subsidies of up to 25% of project costs).   + The **SHAMCI** certification scheme for SWH has been adopted by Egypt in 2014.   + NREA is preparing a financing scheme for replacing electric with SWH and Ministry of Treasury has tentatively approved the co-financing of replacing 50,000 electric water heaters at hotels.   + Ministry of Housing: **Decree 401/1987** to equip new housing units with SWH was never properly enforced and contractors have found ways to pass initial verification and install electric water heaters instead. The current legislative framework requires clarification.[[18]](#endnote-18)   + Potential of installing 240,000 m2 p.a. if law enforces the installation of SWH in new buildings[[19]](#endnote-19)   + **Problem**: high SWH up-front cost (5,500 EGP compared to 650 EGP for electric water heaters) leaving only the high income groups installing systems 🡪 market incentive programs needed to make SWH more economically attractive.[[20]](#endnote-20)   **Biomass**  Production of biomass energy using agricultural, animal, human and solid waste has high potential in Egypt (through gasification or direct combustion). The biomass potential of Egypt has been estimated at annually 40 million tons or 3,600 ktoe. Potentially 1,000 MW could be generated from agricultural waste.[[21]](#endnote-21) This potential, however, has been left untapped to a large extent. Power generation from the gasification of sewage sludge in waste water treatment plants (EL-Gabal El-Asfer 23 MW plant) is already being used.[[22]](#endnote-22) |
| **State & Key Properties of Energy Efficiency** | Egypt has an **overall low efficiency** in using energy resources and is among the most energy intensive economies in the MENA region as well as in the world.[[23]](#endnote-23)  Highly subsidized energy prices have led to inefficient use and a skyrocketing energy demand.  **EE in buildings**  More than 60% of the energy in Egypt is consumed in residential, commercial and governmental buildings. In order to address efficiency of buildings, three mandatory EE Building Codes have been developed, which estimate a 20% reduction in energy consumption. Compliance is, however, still low.  Figure 6: Electric Power Transmission and Distribution Losses. Source: own elaboration based on: <http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators>  Moreover, minimum performance standards with mandatory labeling schemes have been introduced for household appliances such as refrigerators, freezers, washing machines, air conditioners, CFLs, and electric water heaters.  Especially lighting plays a crucial role as it accounts for a third of the energy consumption in residential and commercial buildings. The NEEAP therefore focused on a large-scale exchange of incandescent light bulbs by CFL.  **EE in the industrial and power sector**  The average efficiency of Egypt’s power plants is currently just 40%. Combined cycle technologies can increase power plant efficiency up to 60%.[[24]](#endnote-24)  In December 2015, Egypt (ENCPC) and the IFC (International Financial Corporation) have launched an EE Program, which aims at conducting feasibility studies on local manufacturing of clean energy technologies to be used in the Egyptian industry. Among the key industries targeted will be motor and electric motor factories, which account for 60-70% of the Egyptian industrial energy consumption. In addition, the Egyptian Organization for Standardization and Quality (EOS) will establish standards for the motor market in Egypt to match international norms.[[25]](#endnote-25)  **Barriers to adopting EE measures**  As energy prices are still low due to the subsidies, EE measures do not pay off so far. However, with the expected removal of the subsidies, the situation is likely to change in the next years.  Even with this, however, important barriers – of a financial, technical and regulatory nature – are likely to remain in place and will need to be tackled: such as a general lack of information and awareness about the challenges and opportunities, a lack of incentives (positive and negative) to change the behavior and improve the energy balance, a lack of skilled workers needed to implement EE measures, etc. |
| **Price Setting & Price Reforms** | http://www.mei.edu/sites/default/files/Energy%20chart1_1.jpg**5-year Fuel Subsidy Reduction Plan:**  As Egypt’s conventional power plants receive subsidized fuel inputs, renewable electricity is currently more expensive. The Egyptian government has announced a gradual liberalization of the electricity prices from 2014 to 2018 with the aim to fully remove these subsidies by 2019. The cost of fuel is expected to rise by approximately 20% annually until the fiscal year 2018/2019. This will force generators to purchase oil and gas at international market values.[[26]](#endnote-26)  **5-year Tariff Reform Program:**  Figure 7: Egypt Fuel Subsidies. Source: <http://www.mei.edu/content/at/egypt%E2%80%99s-energy-potential>  The price of the electricity generated from RE will be increased annually, to reach the same rate as wholesale electricity by 2019.[[27]](#endnote-27) |
| **Market Opening / Unbundling** | **Market Opening to Private Investors**  In June 1996, Law No. 12 was modified by Law No. 100 in order to permit the **private sector** to build, own, operate and transfer (BOOT) power plants.  **Unbundling**  In 2001, EEHC unbundled the generation, transmission and distribution activities and formed 13 new companies (5 for production, 1 for transmission and 7 for distribution). Due to the high growth rate of the number of power plants, network expansion and customer service centers, further unbundling took place. Now **EEHC has 16 affiliated companies** (6 for production, 9 for distribution and 1 for transmission: the Egyptian Electricity Transmission Company, EETC).[[28]](#endnote-28)  In July **2015**, the new Electricity Law (87/2015) has **ended the single buyer system** of EETC and allowed private generation companies to sell their production to end users. |
| **Main Institutional Actors in Energy-Related Fields** | 1. **Ministries and Affiliated Bodies**  |  |  | | --- | --- | | **Ministry of Electricity and Renewable Energy (MoERE)**   * responsible for energy generation, transmission & distribution and general planning related to electricity | **New and Renewable Energy Authority (NREA)**   * national focal point for developing, promoting & regulating RE/EE programs   **EEHC & EETC** (see below) | | **Ministry of Environment**   * responsible for formulation of environmental policies, project planning and implementation | **Egyptian Environmental Affaires Agency (EEAA)**   * executive arm of the Ministry | | **Ministry of Petroleum and Mineral Resources**   * responsible for meeting domestic market needs, securing oil and natural gas supplies and maintaining sustainable development | **Egyptian General Petroleum Corporation (EGPC)**  **Egyptian Natural Gas Holding Company (EGAS)**  **Egyptian Petrochemicals Holding Company (ECHEM)**  **Ganoub El-Wadi Petroleum Holding Company (GANOPE)**  **Egyptian Geological Survey and Mining Authority (EGSMA)** |   **Egyptian Supreme Council of Energy (SCE)**   * Ministerial committee / highest policy-making body in the energy sector; establishes the national energy strategy * 12 Ministers in the Council (Defense, Finance, Petroleum, Electricity, Economic Development, Environment, Investment, Housing, Trade & Industry, Transport, Intelligence and Foreign Affairs) headed by the Prime Minister   **Energy Efficiency Unit (EEU)**   * Created under the Cabinet of Ministers (COM) * Gives technical advice to SCE, coordinates national EE efforts   **Egyptian Green Building Council (EGBC)**   * Under the Housing & Building Research Center (HBRC) * Members from government ministers (national and international), NGOs and private sector * Promotes EE in the housing sector & supports the creation of Green Pyramid Rating System (GPRS)  1. **Regulator**   **Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA)**   * Independent supervisor & coordinator between electricity producers, transmitters, distributors & end users * Electricity regulator in terms of licensing, designing tariffs & developing a competitive market design and structure  1. **Electric Utilities in Egypt[[29]](#endnote-29)**  * **Government-owned (under the Egyptian Electricity Holding Company, EEHC)**  |  |  |  | | --- | --- | --- | | **Generation** | **Transmission** | **Distribution** | | * Cairo Generation Company * West Delta Generation Company * East Delta Generation Company * Upper Egypt Generation Company * Hydro Plants Generation Company * Developing and Utilizing NREA | * The Egyptian Electricity Transmission Company (EETC) (=independent transmission system operator (TSO) of the power system in Egypt) | * North Cairo Distribution Company * South Cairo Distribution Company * Alexandria Distribution Company * North Delta Distribution Company * South Delta Distribution Company * Behaira Distribution Company * Canal Distribution Company * Middle Egypt Distribution Company * Upper Egypt Distribution Company |  * **Private Sector-owned (BOOT projects & independent companies)**  |  |  |  | | --- | --- | --- | | **Generation** | **Distribution** | **Generation & Distribution** | | * Suez Gulf Power Company (BOOT Project) * Port Said East Power Company (BOOT Project) * Sidi Krir Generating Company (BOOT Project) * International Bensmark Power * MIDOR for electricity (Medallak) | * The Egyptian Chinese Joint Venture Company for Investment * Delta Company For constructions and reconstruction * Engineering group For electric energy * Madinety Electrochemical Energy * New Giza Eternal Luxury * City Services | * Global Energy Company * Alexandria Carbon Black co. SAE * Om El Goreifat * National Electricity Technology Company (Kahraba) * Mirage * Sendian Company For Paper Industry * Consukorra Company for commercial proxies and technical consultations * Power House Company * ElGouna Electric * Generget Company for renewable energy * Emak for Utilities and Services S.A.E | |
| **Open Issues / Reforms** | * **Incentives / obligations** for EE measures (energy audits) * **Subsidies removal** (so far, most renewable power sources are not competitive in price with fossil fuels!) * **FiT reform** (creating a level-playing field between large and small RE installations) * Enforcement of decree for integrating **SWH in new buildings** |
| **Main Obstacles / Gaps** | * **No EE law** * **Intensive capital cost of RE projects,** since most of the equipment needed is not locally manufactured so far. * **Liquidity problems:** no direct access to intl. financial markets, low reserves of foreign hard cash |

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| **Part 3: Structure and Evolution of Local Benefit Sharing** | |
| **Observable / Forecasted Value Creation** | **Economic Value Creation:**   * **Local Manufacturing:**  About 40% of the solar field of the CSP plant Kuraymat in Egypt was generated locally. Also, the local content reaches only 20-30% of the wind farms in Egypt (towers, cables, transformers, civil & electrical works).[[30]](#endnote-30)  A new factory for blade manufacturing is being prepared by Siemens Company and will become operational in August 2017. A new multi-modal assembly plant of First Solar in the Gulf of Suez area (details unknown) and a number of PV modules Assembly Factories exist.   **Social Value Creation:**   * **Access to electricity:** 15 MW off-grid PV installations to provide rural/touristic areas with energy that do not have access to the national electricity grid (about 0.4% of the population) 🡪 lighting, water pumping, wireless communications, … * **Energy security:** As Egypt is facing a growing energy demand and a decreasing generation from fossil fuels, RE is helping to secure the energy supply of the country.   **Environmental Impacts**[[31]](#endnote-31)   * The Egyptian Environmental Affairs Agency (EEAA) is responsible for Environmental Impact Assessments (EIA). * Expected electricity generation from RE: 49 TWh/year by 2022/2023 (including hydro). 🡪 **Fuel Saving:** 9.7 million toe/year & **CO2 emission reductions:** 25.3 tCO2/year * Negative impacts of Red Sea wind parks on bird migration. |
| **Observable / Forecasted Job Creation** | **Observable Job Creation**   * **Green Economy Approach** by the Ministry of Environment in order to tackle employment effects   **Forecasted Job Creation through RE/EE according to NREA[[32]](#endnote-32)**   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | **2016** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | | Indirect employment (5 jobs / MW) | 8,435 | 10,050 | 13,000 | 5,850 | 5,750 | 1,750 | 1,750 | 1,600 | | Direct employment (0.5 jobs / MW) | 843 | 1,005 | 1,300 | 585 | 575 | 175 | 175 | 160 |   Overall: NREA estimates a creation of 4,800 direct jobs and 48,200 indirect jobs by 2023, which points to a very high expected degree of industrial integration (realistic expectations?). It is, however, not differentiated between permanent and short-term jobs.  **Wind**  High potential for local manufacturing, due to quickly critical size of the domestic market. Moreover, the local production of wind tower components saves transportation costs. High potential also for installation and O&M. Problem: considerable distance between the large parks and the main urban & industrial hubs of the country.  Figure 8: Forecasted Job Creation through RE/EE. Source: own elaboration based on: <https://energypedia.info/images/c/c4/Mohamed_Salah_El_Sobki,_New_and_Renewable_Energy_Agency_%28NREA%29.pdf>  **CSP**  CSP’s job potential is in both component manufacturing and plant assembly. Local production potential is lower than for wind. However, most raw materials are available and local companies could initially engage in assembling steel structures, metallurgical processes, supplying some electronic components and cables, piping and insulation and at a later date mirror and possibly float glass production.[[33]](#endnote-33)  **PV**  Small and medium sized enterprises can play a large and active role providing local manufacturing in the area of the entire construction and assembly (modules, steel support structure and electronic components) as well as installation and maintenance of small scale applications for households or smaller industrial applications.  **SWH**  Estimates based on the Tunisian PROSOL program indicate a potential of 27,500 additional jobs by 2030 through SWH dissemination, half of them in the production (manufacturing of tanks and sensors) and the other half in installation and maintenance.[[34]](#endnote-34) Due to a lack of current targets/programs a clear scenario for the development of the SWH market is, however, missing.  **Construction**  According to the World Bank construction makes up about 5% of Egypt’s GDP, while real estate represents another 3%, contributing to about 12.5% of economic growth and 7% of jobs. Every year, Egypt needs to build about 550,000 new housing units. Construction and housing are amongst the largest, most labor intensive job sectors in Egypt, making up close to 12% of total employment by the end 2012—about 2.8 million employees. This carries a great potential to create jobs related to EE in construction. |
| **Existing Training & Research Capacities** | Two major cooperation projects between Egyptian and foreign universities exist:   * **E-JUST: Egypt-Japan University of Science and Technology** Master and Doctoral Programs in Energy Resources and Environmental Engineering * **REMENA: RE and EE for the MENA Region**   Joint International Master of Science (M.Sc.) Program of the University of Kassel and Cairo University for 21 months with double master degree  Furthermore a five-year **Renewable Energy Engineering** bachelor program (B.Sc.) at **Zeweil City – University of Science and Technology** and **EE Master Courses** at **El Gouna University** are offered.  According to a survey conducted by GIZ/RE-ACTIVATE in December 2015, the following **6 training providers & research institutions for RE/EE in Egypt** (with a total of about 50 trainers) were interviewed:   * International Academy for Renewable Energy & Energy Efficiency (IAREEE) * Oasis Renewable Energy (ORE) * Solar Energy Development Association (SEDA) * German-Arab Chamber for Industry and Commerce (AHK) * Energy Research Center (ERC), Cairo University * Solar Energy Department, National Research Centre (NRC)   Annually, these training providers offer some **100 courses** for about **1,000 participants**, focusing especially on **PV** (on- and off-grid, solar pumping …) and **solar thermal**. ORE is the only of the 6 institutions offering specific trainings in wind energy. AHK and ERC provide also trainings in EE (EUREM - European Energy Manager Trainings offered by AHK in Egypt).  In addition, the **RENAC-OASIS Solar Academy Egypt (ROSAE)**, set up by the Renewables Academy (RENAC) and ORE with the support of SEDA, offers courses for engineers, installers, investors and other professionals with an interest in solar electricity (off-grid and grid-tied) and solar thermal energy, including practical exercises. All courses offered by ROSAE are approved by SEDA, guaranteeing quality and the adaptation of the contents to the local conditions and needs. Also train-the-trainer courses are offered and conducted by former participants with the support of RENAC trainers.  NREA has a training unit responsible for giving trainings related to RE and EE.  **On-the-job trainings** in wind energy, generally related to O&M, are directly provided by the foreign suppliers of machinery or by NREA.[[35]](#endnote-35)  The **Ministries** active in the field of vocational training are: Ministry of Higher Education and Scientific Research, Ministry of Trade and Industry and Ministry of Electricity and Renewable Energy. Each of these Ministries works **independently** and runs some affiliated institutions providing, regulating or accrediting the trainings. These institutions are, however, not interconnected.  The **private sector** on the other hand is totally **unregulated** and follows a different procedure, where each of the training providers set its own programs and criteria for accreditation.  Comparing the training offers of public and private trainings providers, it can be noticed that the private institutions are giving more in depth RE/EE trainings. |
| **Anticipated Training & Research Needs** | **Adequate Trainings**  Training providers in Egypt **do not focus sufficiently on market needs**. In order to build high quality projects, engineers, technicians and installers with relevant skills and competences are needed. However, the training of intermediate technicians and craftsmen is largely neglected, while university trained engineers lack practical knowledge. Hence, any training program should be oriented as closely as possible to the needs of the labor market, and especially to the skills and knowledge required for a certain job profile / work activity. There needs to be a strong exchange between training providers and projects developers, components manufacturers and service providers for RE/EE.  **Wind training offers**  So far, training offers for wind energy are underrepresented. In the light of the 2020 target to increase wind energy to 7.2 GW, and given that the conditions of manufacturing wind power plant components locally are favorable, training offers in the field of design, production and installation should be extended:   * Engineers, technicians and supervisors for the manufacturing of different components of wind farms, such as wind blades and towers. * Engineers for the design and construction of wind farms, plus technicians for their maintenance.   **On-the-job trainings**  Especially for O&M activities, on-the-job trainings are essential as long as the formal training and education system is not responding to the specific skill needs. So far, on-the-job trainings are undertaken at a relatively small scale by enterprises and donor initiatives.[[36]](#endnote-36) |
| **Further Innovation Related Institutions** | **Egyptian Renewable Energy Cluster Initiative (ERECI)**   * Still in nascent stages, research orientation   **Egypt National Cleaner Production Center (ENCPC)**   * Trainings, energy audits & EE measures in the industry   **Environmental Compliance Office in the Federation of Egyptian Industry (ECO-FEI)**   * Energy audits, EE/RE consulting projects, exclusive distribution agent for a fund by the Egyptian National Bank to support investments in EE and RE for SMEs at a 0% interest rate.   **Sustaincubator**   * specialized in food, renewable energy and water |
| **PSD / HCD Support Mechanisms** | **Nawart Program**[[37]](#endnote-37)   * Renewable Energy Start-Up Support Program launched in January 2016 * By CleanTech Arabia and PwC, supported by GIZ and MTI * Technical & business training, investment & networking opportunities, business & technical consulting   **Industrial Modernization Center (IMC)**   * Supports industrial enterprises according to their development needs through comprehensive and customized business competitiveness programs: for example the EE, RE and environmental protection program   **Industrial Training Council (ITC)**   * Supervises and coordinates all TVET activities related to the MTI to increase their efficiency, link them to the real needs of different industrial sectors and maximize utilization of available resources |
| **Labor Market / Employment Mechanisms** | **Regional Labor Market Observatories (RLMO)**  Several RLMOs have been established under the leadership of the private sector and with support of the Ministry of Education and the Ministry of Manpower and Migration. The role of the observatories is to analyze the needs of the labor market and to offer practical projects aiming at linking the Technical and Vocational Education and Training (TVET) System to the private sector needs. The RLMO-Aswan for instant uses the PROSPECT method in order to gain labor market information which they provide through reports to the decision makers at different institutions. This information is to be used for curricula development as well as training and qualification of young people in order to help graduates finding a suitable job.  **ELMA**  An employment and labor market assessment (ELMA) for Egypt is currently conducted by a GIZ employment promotion project. |
| **Main Institutional Actors in Sustainable Economic Development** | 1. **Ministries and Affiliated Bodies**  |  |  | | --- | --- | | **Ministry of Higher Education and Scientific Research (MHESR)**   * responsible for the educational activities of the public and private universities | Supreme Council of Universities  Supreme Council of Private Universities  Supreme Council of Technical Institutions  National Research Centre (NRC) | | **Ministry of Education (MoE)** |  | | **Ministry of Trade and Industry (MTI)**   * responsible for upgrading national industry through modern international technology and expertise and a comprehensive trade scheme setting export promotion as a priority | Industrial Modernization Center (IMC)  Industrial Training Council (ITC)  Egypt Technology Transfer and Innovation Center (ETTIC)  Egyptian National Cleaner Production Center (ENCPC)  Industrial Development Authority (IDA)  Egyptian Organization for Standardization and Quality (EOS)  [Industrial Control Authority](http://www.mti.gov.eg/english/affiliates/industry/ica/ica.htm) (ICA)  [Productivity and Vocational Training Department](http://www.mti.gov.eg/english/affiliates/industry/pvtd/pvtd.htm) (PVTD)  [Egyptian Accreditation Council](http://www.mti.gov.eg/english/affiliates/industry/egac/egac.htm) (EGAC) | | **Ministry of Electricity and Renewable Energy (MoERE)** | New and Renewable Energy Authority (NREA)(training unit for RE/EE) | | **Ministry of Local Development** |  | | **Ministry of Manpower and Migration (MoMM)** |  | | **Ministry of Agriculture and Land Reclamation** |  | | **Ministry of Tourism** |  |  1. **Concerned industrial and professional associations:**  * Solar Energy Development Association (SEDA) * Egyptian Wind Energy Association (EGWEA) * Egypt Solar Industry Association (Egypt-SIA) |
| **Relevant Private Sector Actors** | **Main R&D, Manufacturers & Installers (selection):**  Solar sector:   * **Sunprism**: manufacturing of PV modules; 15 MW/year capacity; over 100 qualified engineers & technicians * **MEET Egypt**: ISO certified; design, manufacturing, project management & installation of PV systems * **OneraSystems**: created by MEET; ISO & OHSAS certified; R&D, design, manufacturing & installation of PV systems * **ASET**: design, sales, installation and maintenance of PV systems * **BIC for Electronics Environment & Energy**: manufacturing of PV modules * **Eco Electric Solution:** development of green solutions (PV, LED lighting…) * **Ener Egypt JSC:** manufacturing & installation of PV systems, LED lighting * **Egyptian Solar Energy Society:** research institution, engineering & manufacturing of solar water pumps * **TaqaMisr:** SWH project developer, installer, etc. and developer of “Vulcan” SWH * **Kallouf Future Power:** ISO certified; manufacturing and installation of SWH   Wind sector:   * **SWEG**: manufacturing of wind energy components, wind turbines, wind towers & rotor blades   Various sectors:   * **Futek Lighting:** Japanese/Egyptian; R&D, manufacture plant; high efficiency lighting for streets & buildings * **Green Tech Solutions:** development, installation of green technologies (PV, small wind, water pumps) * **Sun Energy:** manufacturing of solar cookers, installation of SWH, solar pumps * **ACT Green Energy Solutions**: Development & Building of SWH, lighting, solar water pumps, wind power stations |
| **Open Issues / Reforms** | * Education/employment strategy for RE/EE * Coordination across sectors/policy fields |
| **Main Obstacles / Gaps** | * Trainings not adequate * Training development structure complex (several Ministries involved) * Government preference for large projects requiring expertise for and experience with such projects * Few local RE manufacturers on the market * Preferential customs rates for imported RE equipment |

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| **Part 4: Anticipated Market Development** | | | |
| **Generation** | **Existing Capacity** | **Additionally planned projects** | **Targets** |
| **PV** | 35 MW | 240 MW | 2,777 MW (by 2022) |
| **CSP** | 20 MW | 50 – 150 MW | 150 MW (by 2022) |
| **SWH** | 800,000 m2 |  |  |
| **Wind** | 750 MW | 250 MW | 6,810 MW (by 2023) |
| **Biomass** | 23 MW biogas |  |  |
| **Efficiency** | **Low** | **Moderate (BAU)** | **High** |
| **Buildings** |  |  | EE to contribute by 8% to the reduction of energy needs (by 2022) = 20% of current usage |
| **Industry** |  |  |
| **Agriculture** |  |  |
| **Services** |  |  |
| **Socio-Economic Impact** | **Low** | **Moderate (BAU)** | **High** |
| **GDP growth (% p. a.)** |  | 3.83% (2020)[[38]](#endnote-38) |  |
| **Value Added** |  |  |  |
| **Employment** | EE in Buildings (2030): (Plan Bleu)  560,850 new jobs | Overall Unemployment Rate reduction from 12.8% to 9.8% (2020)  EE in Buildings (2030): (Plan Bleu)  644,607 new jobs  RE/EE (2023): (NREA)   * 48,185 new direct jobs * 4,818 new indirect jobs | EE in Buildings (2030): (Plan Bleu)  728,400 new jobs  SWH (2030): (Plan Bleu)  27,500 new jobs (13,750 in manufacturing and 13,750 in installation & maintenance) |
| **General Observations** | **Two transitions in the next few years:[[39]](#endnote-39)**   * A **physical transition** as Egypt moves from generation that is overwhelmingly fueled by oil and gas, supplemented by the Aswan dam, to significant, and growing, reliance on **wind and solar**. * A **structural transition** as Egypt moves from a sector that is centralized, fully regulated and state-dominated to one that is **diverse, deregulated and with a growing private participation.**   In 2018, there could be 80 or more private energy generators, most of them renewable. This is supported by the FiT scheme, which is deliberately designed to ensure the introduction of a diverse range of participants to the sector. | | |

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| **Part 5: Most Relevant Interlocutors & Cooperation Partners for RE-ACTIVATE** | | | |
| **Actor** | **Name** | **Focus** | **Opportunity for Cooperation** |
| **GIZ:**   * **Sustainable Infrastructure: Energy/Water Environment** * **Sustainable Economic Development: PSD/EP/TVET** | 2014.2187.4: Egyptian German Joint Committee on RE/EE (JCEE) (2015-2018)  Creation of a wind energy center  2014.2182.5: Egyptian-German Private Sector Development Program (PSDP) (2015-2018)  2015.2156.6 Promotion of the Dual Education System in Egypt (2015-2018)  National Employment Pact (NEP), Regional Employment Dialogue | Promote decentralized RE/EE technologies, increase private investment in RE  planned  Promote employment oriented innovations of MSMEs  Increase the number of trainees in the dual education system  Reduce unemployment, especially in the field of blue collar jobs and for young people. | Job creation through RE/EE promotion, especially via distributed schemes, inclusion in official energy policy discussions/documents  Development of trainings and especially training standards related to wind energy, cooperation with training centers of ONE and STEG  Component to RE/EE related and employment oriented innovations  Seek opportunities to integrate RE/EE elements into the TVET system, and to apply the dual education system to RE/EE jobs  Improve labor market information & matching schemes with regard to RE/EE, support job placement in the sector (e.g. through regional pilots) |
| **Non-GIZ:**   * **Domestic public institutions** * **Private sector/ civil society** * **International organizations on the ground** | Regional Center for Renewable Energies and Energy Efficiency (RCREEE)  New and Renewable Energy Agency (NREA)  Egyptian National Cleaner  Production Centre (ENCPC)  Industrial Modernization Center (IMC), Industrial Training Council (ITC)  University of Cairo and El Gouna,  Solar Energy Development Association (SEDA)  Environmental Compliance Office, Federation of Egyptian Industries (ECO-FEI)  Egyptian Renewable Energy Cluster Initiative (ERECI) [nascent stages]  KfW  UNEP | Enable & increase the adoption of RE/EE in the Arab region  Enable & increase the adoption of RE/EE in the Arab region  Green technologies in the industry (audits, management, investment)  Research orientation, cooperative industry-research partnerships | Already cooperating  Already cooperating  Partner for realization of a cluster-like initiative (see cluster study)  Partner f. developing/implementing trainings and training standards  Research/Trainings  mid-term partner for potential specific research (see cluster study) |

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| **Part 6: Identifiable Future Opportunities for German International Cooperation** | | | |
| **Sector** | **Objectives** | **Outcomes** | **Partner** |
| Wind | Improve Quality Infrastructure for Wind Power Trainings | * Support certification / standards development for training * Support creation of a wind training center * Support cooperation and joint trainings curricula with MAR/TUN | NREA / RCREEE |
| SWH | Lay the bases for a domestic SWH market | * Regional gap analysis and quality infrastructure support, esp. with regard to training standards, training centers and companies * Increase trainings in manufacturing, installation, maintenance, incl. on the basis of dual training systems | PSDP / JCEE  RCREEE / NREA |
| TVET RE/EE | Strategy for vocational and further training | * Job needs in sub-sectors (number and qualification) * Develop strategy | Ministry of Trade and Industry, Industrial Training Council (ITC),  RCREEE, TVET Project |
| EE | Promote market frameworks for distributed applications coupled with EE | * Job effects / potential analysis * Sectoral deepening, e.g. for agriculture and food processing or for EE in the industry | RCREEE / NREA / MoERE / JCEE  ENCPC |
| SWH in the industry & tertiary sector | Potential and profitability of SWH in the industry & tertiary sector | * Potential Analysis * Job Effects | RCREEE, NREA  PSDP, JCEE  ENCPC |
| PV in the industry & tertiary sector | Promote the use of distributed PV in the industry & tertiary sector | * Develop a market study and a manual for distributed PV systems * Provide technical assistance for pilot projects | RCREEE |
| PV on grid | Mapping of administrative rules and procedures to allow for a better understanding of the PV sector | * Develop a visual tool / process analysis for FiT schemes * Develop a visual tool / process analysis for import requirements | RCREEE |
| PV off-grid | Promote the use of hybrid systems in industry, agriculture and hotels | * Develop a market study and a manual for PV hybrid systems * Provide technical assistance for pilot projects | RCREEE |

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